

Lab 4, Differential Scanning Calorimetry (DSC)  
Lab report information

Make sure that your report addresses the following questions, based on the series of differential scanning calorimetry (DSC) experiments. Adding comments to graphs using a pen is fine with me. Also **include any observations** that you made during the experiment.

**Experiment 1: Results for a well-characterized polycarbonate sample**

1. Compare the  $T_g$  measured in your experiment with the literature value for polycarbonate. *Discuss to some extent; don't just say "it agreed" or "it didn't agree".*

**Experiments 2 and 5: Results for poly(ethylene terephthalate) samples**

2. Compare (quantitatively) the transitions observed in the following PET samples:
  - broad-lid food container
  - bottom of water bottle, previously exposed to boiling water
  - top of water bottle, not exposed to boiling water
  - top of water bottle, but upon repeating the measurement after the quick quench of the first DSC experiment
  - top of water bottle, after the rapid quench and after heating the sample to 135°C, holding it there for 5 minutes, quenching to 40°C, and repeating the DSC scan
  - part of a water bottle that has "30% less plastic"

What transitions were observed? How do they compare to results in the literature? *How do the transitions relate to the observations you made about these samples in the hot water portion of lab 1?*

3. How large were the transition peaks in each sample? What does this overall collection of measurements imply about polymer processing effects on PET?

**Experiments 3 and 4: Functioning and nonfunctioning polyurethanes from Mackal Gym**

4. Compare the results for the good and bad gym floor samples, for both 2003 and 2005 materials. What transitions were present?
5. What mass losses (both relative and absolute) did you measure in your samples? *What do the mass losses and transitions imply about these polyurethane samples?*

**Experiment 6: Plastic bags**

6. Compare the results for the biobag and HDPE bag. What transitions were measured? What do the data for the biobag suggest about its composition? *How do your results relate to the observations you made about the mechanical properties of these samples in the hot water portion of lab 1?*

**General question**

7. The DSC experiment involves heat flowing into the polymer sample to heat it up. Estimate the temperature gradient across 1 mm of a polymer sample for a heating rate equal to the rate found in your experiment. What does that temperature gradient suggest about the accuracy of the results as a function of heating rate?